(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.6, Issue No.6, October - November 2018, 8886-8890

Modelling And Computational Fluid Dynamics Analysis Of Economizer In Tangential Fired Tube Boiler

ADASU THIRUPATHAIAH
M.Tech Student, Dept of Mech, Nishitha College of Engineering & Technology, Hyderabad, T.S, India

B.RAMESH
Assistant Professor, Dept of Mech, Nishitha College of Engineering & Technology, Hyderabad, T.S, India

Abstract: **In boilers, the tools of the economy are heat exchangers, where heat transfer factors generally reach the point that does not generally exceed the boiling point of that liquid. Economists call this because they can use thermal content in hot liquid flows, but not warm enough to use in the boiler, thereby restoring the most useful thermal content and increasing boiler efficiency. A frugal can be used to increase the temperature of the water supply and reduce the amount of heat needed in the boiler. In this article, a tradition of the economy is achieved, making it possible to study flow models developed in the fluid and circulate them throughout the economy. The details of the failure in the past indicate that corrosion has a greater effect on the U-shaped parts of the econometric mass due to an increase in gas flue velocity near these curves. But the speed of the combustion gases was surprisingly close to the lower curves with respect to the upper curves. In this thesis, thermal heat transfer in the economizer is determined by modifying the mass flows by CFD and thermal analysis. The materials used for the pipes are stainless steel and aluminum alloy 5083 and 6066. The variable mass flow meters will be 100,90 and 70 kg / s. CFD analysis is performed to determine temperature distribution and heat transfer rate by changing the mass flow rate. Heat transfer analysis is performed in the econometrics to evaluate the best materials. 3D modeling is performed in CREO and ANSYS analyzes.**

Keywords: ***Economizer, Boiler, Creo, CFD analysis, ANSYS.***

I. INTRODUCTION

1.1 STEAM BOILER: The steam or boiler generator is defined as a closed vessel in which water is converted to steam by burning fuel in the presence of air at the required temperature, pressure and flow rate. According to the American Society of Mechanical Engineers (ASME), a steam generator or boiler is defined as "a set of devices for producing, finishing or recovering heat with a heat transfer device so that it is available for liquids that are heated and evaporated by the boiler or that a steam generator is an example of a heat exchanger.

1.2 Classification of Boilers:

According to location of boiler shell axis:

- Horizontal
- vertical
- Inclined boilers.

When the axis of the boiler body is horizontal, the boiler is called a horizontal boiler. If the axis is vertical, the vertical boiler is called boiler and if the axis of the boiler is inclined, it is called inclination.

1.3 Boiler accessories

Boiler accessories are those components which are installed either inside or outside the boiler to increase the efficiency of the plant and to help in the proper working of the plant.

1.3.1Various boiler accessories are:

- Air pre-heater
- Super heater
- Feed pump
- Injectors
- Economizer

1.3 ECONOMIZER: Economizer is a mechanical devices intended to reduce energy consumption or to perform useful function such as preheating a fluid.

- In simple terms, an economizer is a heat exchanger
- A heat exchanger is a device that enables the transfer of heat from one fluid (liquid or gas) to another without direct contact between the fluids. For heat transfer, the fluids must be at different temperatures and they must come into thermal contact.

Distribution of the velocity and pressure of the working fluid within the frugal. The frugal is made of. In boilers, fitters are heat exchangers that heat liquids, usually water, to a boiling point without normally exceeding the boiling point.

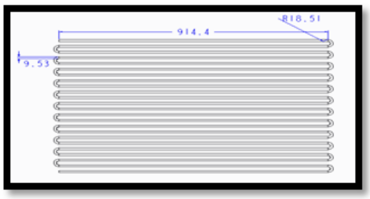
II. LITERATURE REVIEW

2.1 CFD Investigation of Combustion in 660MW Tangential Fired Boiler Studies Explain the effects of operating conditions in an accidental end oven using the FLUENT symbol presented in this document. The three-dimensional combustion model is used to determine temperature, velocity, and other thermal properties such as the O2mass portion and the CO2 portion for an average extinguisher of 660 MW. The particle pathways are studied to determine the causes of operational problems such as burner pollution and the temperatures reached in different parts of the boiler during the combustion process. In this project, the United Ocean Air Center is considered primary air containing coal in the furnace temperature configuration. For these studies, we performed a numerical study of the flow of the reaction gas mixture with the combustion of coal powder in a terminal furnace. Calculations from the study sample showed good agreement with measurement data from the experimental facilities. The experience gained from these CFD model studies can improve the operation of the boiler by changing the flow parameters in the boiler, which has been a basis for the operator's expert system.

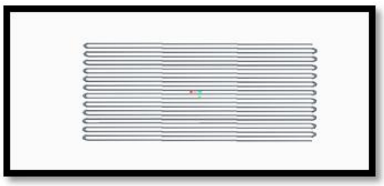
III. RELEATED STUDY

3.1 INTRODUCTION TO CREO: PTC CREO, Advance Pro / ENGINEER, is a software package that includes a program to assemble 3D models to create animations, animations, animations and graphics. Coincides with the battle of 3D frontal CAD modeling, so it possesses a device based on the approved control. By using the parameters, scope and capabilities that enable you to understand your brand positioning, it can enhance the evolution of development in addition to the brand itself. The presentation will be scheduled in 2010 against Wildfire Pro / ENGINEER in CREO. He exchanges with a demon by using the use of his doctrine made by the Parametric Society (PTC), initially about non-associated followers of geographical cultures, one in the creation of any welding modeling plan for the professional project.

2D MODEL



3D MODEL



CFD ANALYSIS FOR ECONOMIZER:

AT MASS FLOW RATE-100Kg/sec

IMPORTED MODEL FROM CREO:

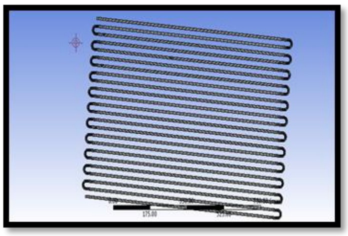


Fig: Imported model from CREO 2.0

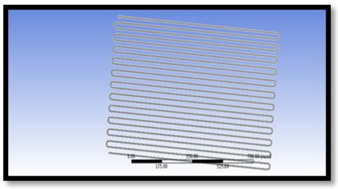


Fig: 5.2– Meshed Model

3.2 SPECIFYING BOUNDARIES FOR INLET AND OUTLET

5.2.1 Inlet

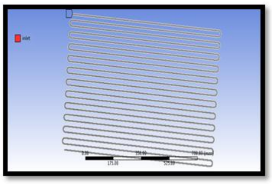


Fig – Fluid inlet

Outlet

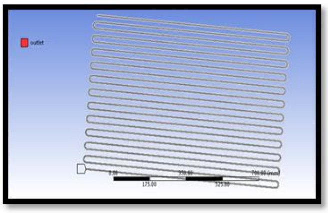
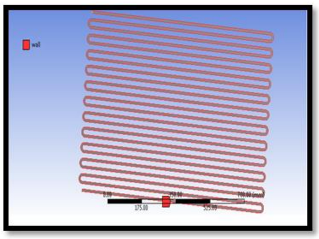


Fig – Fluid outlet

Wall



File export

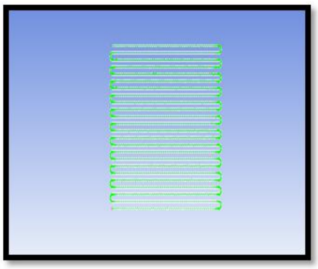


Fig -Wall

PRESSURE:

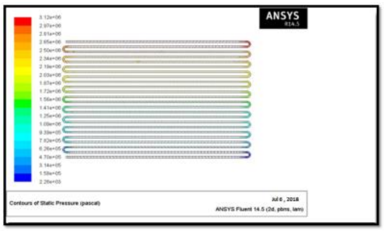


Figure 5.10 contours of static pressure

VELOCITY:

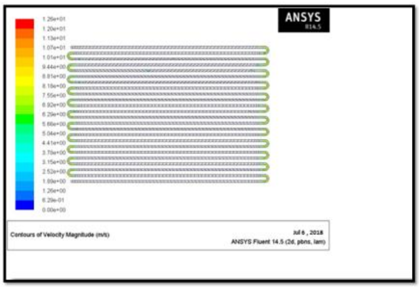


Figure 5.11 Contours of Velocity Magnitude

TEMPERATURE:

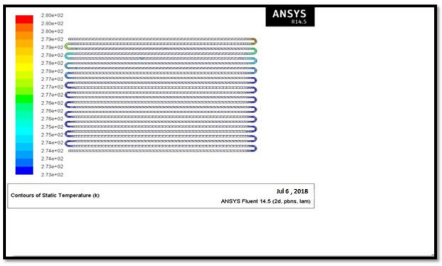


Figure5.12 Contours of Static Temperature

HEAT TRANSFER COEFFICENT:

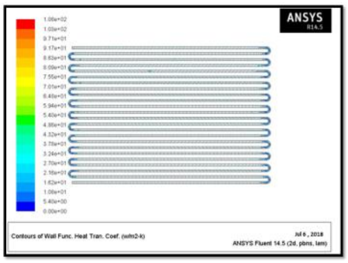


Figure 5.13 Contours of Wall function Heat Transfer Coefficient

3.3 AT MASS FLOW RATE-90Kg/sec

Pressure

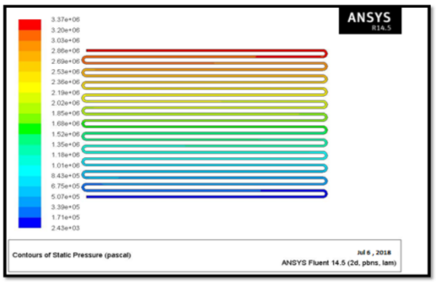


Fig 5.16 Contours of Velocity Magnitude

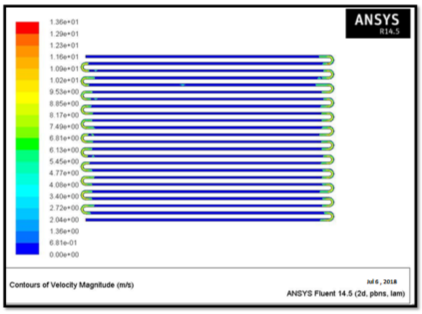
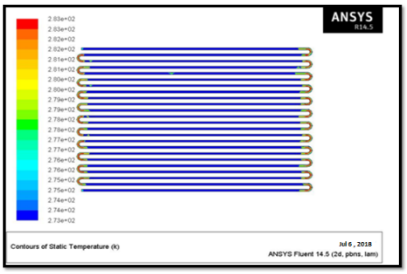
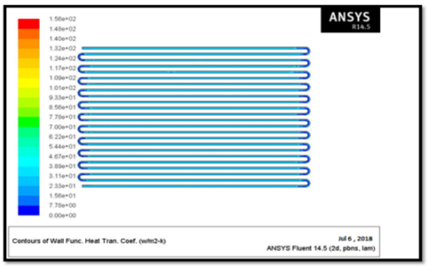


Fig 5.17 Contours of Static Temperature





5.4.1 Mass Flow Rate (kg/s)

inlet	100
interior-_trm_srf	-35416.969
outlet	-99986626
wall	0
Net	0.013374329

5.4.2 Total Heat Transfer Rate (w)

------------------------------- |-----------------

inlet -1588235

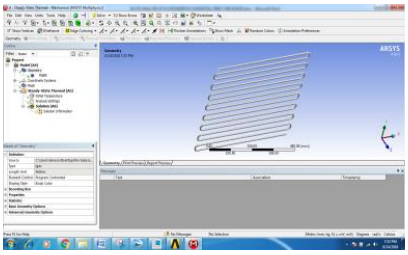
outlet 1600658

3.5 THERMAL ANALYSIS

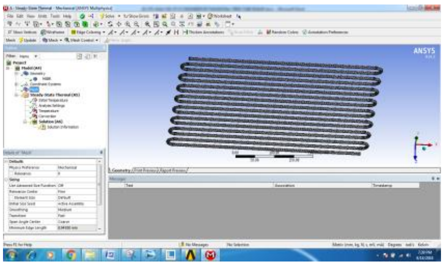
MATERIAL – STAINLESS STEEL

AT MASS FLOW RATE-100Kg/sec

Imported model

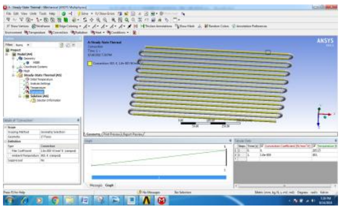


Meshed model

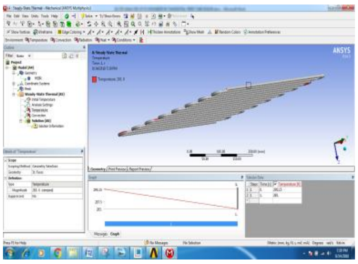


3.6 Boundary conditions

Convection

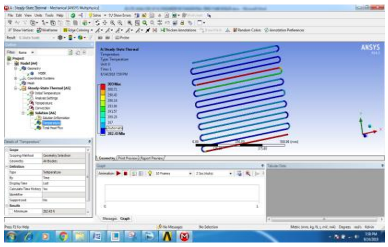


Temperature

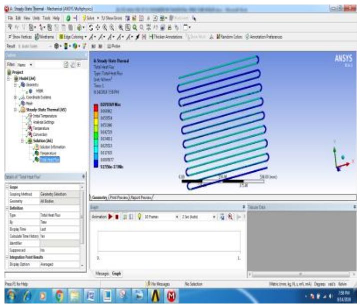


3.6 AT MASS FLOW RATE-90Kg/sec

Temperature



Heat flux

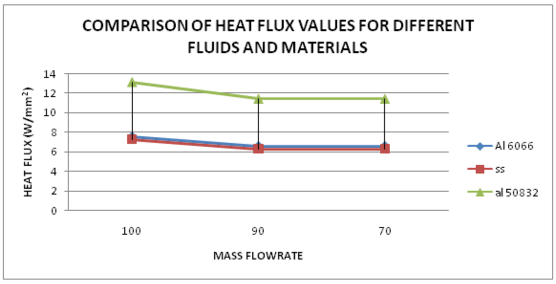


3.7 Comparison of different fluids

MASS FLOW RATE (Kg/sec)	Pressure (Pa)	Temperature (K)	Velocity (m/Sec)	Wall Function Heat Transfer Coefficient (W/m^2-K)	Mass Flow Rate (Kg/Sec)	Total Heat Transfer Rate (W)
100	$3.12e^{+06}$	$2.80e^{+02}$	$1.26e^{+01}$	$1.08e^{+02}$	-0.0278429	855.549
90	$3.37e^{+06}$	$2.83e^{+02}$	$1.36e^{+01}$	$1.56e^{+02}$	0.013374329	-181.78711
70	$1.52e^{+06}$	$2.83e^{+02}$	$1.47e^{+01}$	$1.47e^{+02}$	-0.01423645	-48.704102

3.8 Comparison of different materials results

Materials	Fluids	Convection (W/m^2K)	Temperature (K)		Heat flux (W/mm^2)
			Min	Max	
STAINLESS STEEL	100	108	282.38	303	0.07967
	90	156	282.43	303	0.76569
	70	147	282.33	303	0.082508
ALUMINIUM 5083	100	108	282.91	303	0.3231
	90	156	282.2	303	0.30688
	70	147	282.9	303	0.33819
ALUMINIUM 6066	100	108	282.89	303	0.28692
	90	156	282.9	303	0.27277
	70	147	282.87	303	0.30631



Thermal Analysis Graph

IV. CONCLUSION

In this thesis, a simulation of the zone of economy, which makes it possible to study the models of flow developed in the liquid, while they flow along the economizer. The details of the previous failures reveal that the corrosion increases in the deviation zones with respect to the economic unit, due to the increase in the velocity of the flue gases in the vicinity of these curves. The materials used for the pipes are stainless steel and 5083 and 6066 aluminum alloys. Mass flow rates are 100.90 and 70. CFD analysis is performed to determine heat distribution and heat transfer rates by modifying the mass flow rates. A heat transfer analysis is done on the economy in order to evaluate the best materials. By observing the results of the CFD analysis, the heat transfer coefficient is higher when 90 kg / s is used and the heat transfer rate is higher when R22 is used than other liquids. By monitoring the results of the thermal analysis, the heat flow is greater when using 100 kg / s. When the material 5083. (i.e.) is used, the heat transfer rate is higher when using 100 kg / s liquids and copper.

V. REFERENCES

[1] Krunal P. Mudafale& Hemant S. Farkade CFD analysis of economizer in a tengential fired boiler, International Journal of Mechanical and Industrial Engineering (IJMIE) ISSN No. 2231 –6477, Vol-2, Iss-4, 2012.

[2] A.D.Patil, P.R.Baviskar, M.J.Sable, S.B.Barve to optimize economizer design for better performance, New aspects of fluid mechanics, heat transfer and environment isbn: 978-960- 474-215-8.

[3] A.D.Patil, P.R.Baviskar, M.J.Sable, S.B.Barve Optimization of Economiser Design for the Enhancement of Heat Transfer Coefficient, International Journal of Applied Research In Mechanical Engineering (IJARME), ISSN: 2231 –5950 Volume-1, Issue-2, 2011.

[4] TSUNG-FENG WU Failure Analysis for the Economizer Tube of the Waste Heat Boiler.

